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STUDIES ON ARIZONA ANTS (3) THE HABITS OF *POGONOMYRMEX HUACHUCANUS* WHEELER AND A DESCRIPTION OF THE SEXUAL CASTES

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It has been more than a third of a century since Wheeler described *Pogonomyrmex huachucanus* from a few workers taken in the Huachuca Mountains of Arizona (1). During this period only five additional records have been published for this interesting little species. Three of these were carried in Olsen's 1934 monograph on *Pogonomyrmex* (2). The other two records were published by Cole in 1934 (3) and 1937 (4). While these records have increased the known range of *huachucanus,* they have added little to our knowledge of the habits of this insect. There is good indication that *P. huachucanus* has special significance in the phylogeny of the genus *Pogonomyrmex,* hence it is gratifying to be able to amplify our rather meager data on this ant. During the summers of 1950 and 1951 the writer found numerous colonies of *huachucanus* and was able to study some of them in considerable detail. This paper presents the results of these studies, a review of previously published observations on *huachucanus* and a description of each of the three castes.

The nests of *huachucanus* examined by the writer were very uniform in one respect. In every case they were built in extremely harsh, stony soil. The most striking example of this was a nest taken at the summit of Montezuma Pass in the Huachuca Mountains. This nest was constructed in the hard-packed gravel of the highway. Road work had compressed the gravel to such an extent that "soil" around the nest was almost as hard as concrete. Most of the nests were situated on rather steep slopes and they were generally fully exposed to the sun. The direction of the slope seemed to be of little importance. Three of the nests were constructed beneath stones, the others had no covering object present. In the latter case the nest was provided

with a single, rather irregular entrance about one-half an inch in diameter. From this entrance excavated soil was scattered in an obscure fan down the slope. In one instance there was a low crater of excavated soil about six inches in diameter spread around the entrance. But the construction of a crater seems to be exceptional for this species. The population of a nest of *huachucanus* is comparatively small. As a rule there are less than two hundred workers in a colony. The colonies frequently have two or more queens present but this seems to have little effect on their size. One nest, which was secured entire, had only one hundred and seventy workers present although it contained two females. Occasionally one encounters an especially large nest in which four or five hundred workers may be present, but there would seem to be little doubt that such a number is exceptional.

P. huachucanus is not a conspicuously aggressive ant, but it will defend its nest vigorously if disturbed. It has no hesitation about using its sting, but the effect of the sting is remarkably slight, at least to the writer. I have often been stung by half a dozen workers at once, with no results other than a slight twinge as the stings entered. The persistent and distressing after-effects which often accompany the stings of many species of *Pogonomyrmex* seem entirely absent in the case of *huachucanus*.

The marriage flight of *P. huachucanus* takes place in the latter part of July or the first weeks of August. Although the writer has never seen the marriage flight of this species in progress, there is evidence which makes the above statement valid. Mature males were taken from a nest near Socorro, N. M., on July 31st and others from two nests in Carr Canyon, Huachuca Mountains, Arizona, on August 5th. A large nest found near Springerville, Arizona, on July 30th contained not only many males but an equally large number of deälate females. There were far too many of the latter to suppose that they all represented functional females belonging to the nest. As it had rained heavily an hour or two before the nest was discovered, it seems likely that the storm had interrupted a marriage flight and that the deälated females had taken temporary shelter in the nest. It is safe to conclude, therefore, that the marriage flight of

huachucanus, like that of many other species which occur in southern Arizona, takes place during the rainy season of July and August.

We may now consider the distribution of *huachucanus.* Presented below are the previously published locality records for this species and those which the writer secured during 1950 and 1951. The elevation of each of the first thirteen localities has been checked with U.S. Geological Survey topographic sheets. In addition, many of them have been rechecked with an altimeter as well. The last four localities have been checked against data in Stieler's Handatlas.

Huachuca Mountains, Arizona: Miller Canyon 5600′ (Type locality) W. M. Wheeler; Garden Canyon 5800′, W. S. Creighton; Carr Canyon, 5400′, W. S. Creighton; Pyeatt Cave, 5500′, W. S. Creighton; one mile east of Panama Mine, 5300′, W. S. Creighton; Montezuma Pass, 6700′, W. S. Creighton.

Santa Rita Mountains, Arizona: Mouth of Madera Canyon, 4800′, W. S. Creighton; Sweetwater, 5800′, W. S. Creighton.

Santa Catalina Mountains, Arizona:[1] Sabino Basin, 3700′, W. M. Wheeler.

Dragoon Mountains, Arizona: Texas Pass, 4700′, W. M. Wheeler.

Whetstone Mountains, Arizona: Dry Canyon 5000′, W. S. Creighton.

Baboquivari Mountains, Arizona: Brown Canyon 4200-6000′, W. S. Creighton.

Oracle, Arizona, 4500′, W. M. Wheeler.

Seligman, Arizona, 5500′, A. C. Cole.

Springerville, Arizona, 5600′, W. S. Creighton.

Sixteen miles west of Socorro, N. M., 5300′, W. S. Creighton.

Needles, California, 460′, A. C. Cole.

From these records it can be stated that *huachucanus* usually occurs between the 4000 and 6500 foot levels and, since this is the case, it is clear that Dr. Cole's record from Needles is badly out of line in the matter of elevation.

[1] This record is cited as "South Catalina Mountains" in Olsen's monograph.

For it is more than thirty-two hundred feet below the next lowest record for *huachucanus*. The situation and character of the Needles nest were both unusual for a colony of *huachucanus*. Dr. Cole described it as " a rather minute crater mound in sand." It has been shown above that *huachucanus* nests in gravelly soil and only rarely constructs a crater. Since everything about the Needles record is wrong for *huachucanus*, I wrote Dr. Cole for permission to examine the specimens on which it is based. Unfortunately, they have been lost. There is, therefore, no possibility of a further check on this highly unusual record. In my opinion it is best disregarded. It is very unlikely that the ant was actually *huachucanus* and the inclusion of the Needles record obscures the beautifully clear distributional picture which is shown by every other record for *huachucanus*.

For all the other records for this species indicate that *huachucanus* is a member of the Upper Sonoran ant fauna. Many of the records are from mountainous areas and, when the insect occurs in such regions it prefers foothill canyons as nesting sites. It is equally at home, however, on the grassy, elevated plains at the base of the mountains. But it does not occur in nearby areas of less elevation where Lower Sonoran species are encountered. It is interesting to note that, at the eastern end of its range, *huachucanus* occurs in stations where *P. occidentalis* and the typical *P. barbatus* are also present. The main range of the typical *barbatus* lies in Mexico. That of *occidentalis* lies entirely to the north of it as far as is known at present. Hence there is only a limited area in parts of Arizona and New Mexico where these two species occur in close proximity. For the most part the range of *huachucanus* follows this area of overlap with remarkable exactness. The most obvious explanation for the distribution of *huachucanus* would, therefore, assume an unusually narrow tolerance for temperature on the part of this species. Such a limitation would exclude *huachucanus* from northern regions occupied by *occidentalis* and at the same time debar it from southern areas utilized by the typical *barbatus*. If this explanation is correct, then *huachucanus* shows less environmental adaptability than is usually the case with members of the

genus *Pogonomyrmex*. This point is of interest in view of Wheeler's theory that *huachucanus* is a relict species.

According to Wheeler (1) *huachucanus* and the closely allied Chilean species *bispinosus* are the remains of a primitive *Pogonomyrmex* fauna which originated from the genus *Myrmica* in boreal America and subsequently spread southward through the arid portions of both North and South America. This primitive *Pogonomyrmex* fauna was later replaced in large part by more adaptable, modern species. The replacement left relict species at widely isolated points in the orignal range. This theory, which was designed to explain the close structural similarities which mark *huachucanus* and *bispinosus*, was necessarily based upon the characteristics of the worker of *huachucanus*. Wheeler knew nothing of the male of *huachucanus*. The structure of the male is of particular importance in phylogenetic considerations and it is interesting to find that this caste shows features which agree well with Wheeler's view. The general appearance of the male of *huachucanus* is quite unlike that of the males of the other North American species of *Pogonomyrmex*. The latter are good sized insects as ant males go, with a length of nine millimeters or more. This is true even when the worker caste is comparatively small, as is the case with *desertorum*. The surface sculpture is variable but it is never heavy enough to produce a completely dull surface and, in most cases, the body is distinctly shining. The erect body hairs are long, thin, flexuous and very abundant. They often mat together but, even when they do not mat, they are close enough to each other to obscure the parts on which they occur. The antennal scape is at least as long as the first three funicular joints taken together. The male of *huachucanus* is an exception to each of the above features. It is a small insect, not more than seven millimeters long. The sculpture of the head and thorax is dense, giving these parts a dull appearance. The erect body hairs are well separated, stout, evenly curved and notably shorter than those of the other species. They do not mat together nor do they obscure the parts on which they occur. The antennal scape is less than half as long as the first three funicular joints taken together. As to whether these features can be considered primitive is a

debatable point, but it is certainly true that they give to the male of *huachucanus* an appearance which is much more like that of a *Myrmica* male than is usual for a male of *Pogonomyrmex*. It would be interesting to know if the male of *bispinosus* also shows these characteristics. At present this caste appears to be known only from Spinola's original description (5) which is too imperfect to be of much service.

There is one more point that may have a bearing on the primitive status of *huachucanus*. As already noted, several nests of *huachucanus* were excavated to determine their structure. In particular, two of them were completely exposed with all of the passages opened up. I had expected to find stores of seeds in these nests but failed to do so. Yet this species certainly garners seeds, for one occasionally encounters small quantities of chaff on the excavated fans at the nest entrance. It seems possible that the harvesting habit is poorly developed in *huachucanus*, it gathers seeds but it may fail to store them. If true, this would be a further proof of the primitive character of this species. It is to be hoped that additional observations will give us more light on this point. If nests of *huachucanus* can be examined in the fall, winter and spring and not just during the summer months, it should be possible to show the existence of stores of seeds if this ant makes them.

The general features of all three castes of *P. huachucanus* are shown in the figures on Plate 4. The following descriptions deal mainly with details not shown in the above figures.

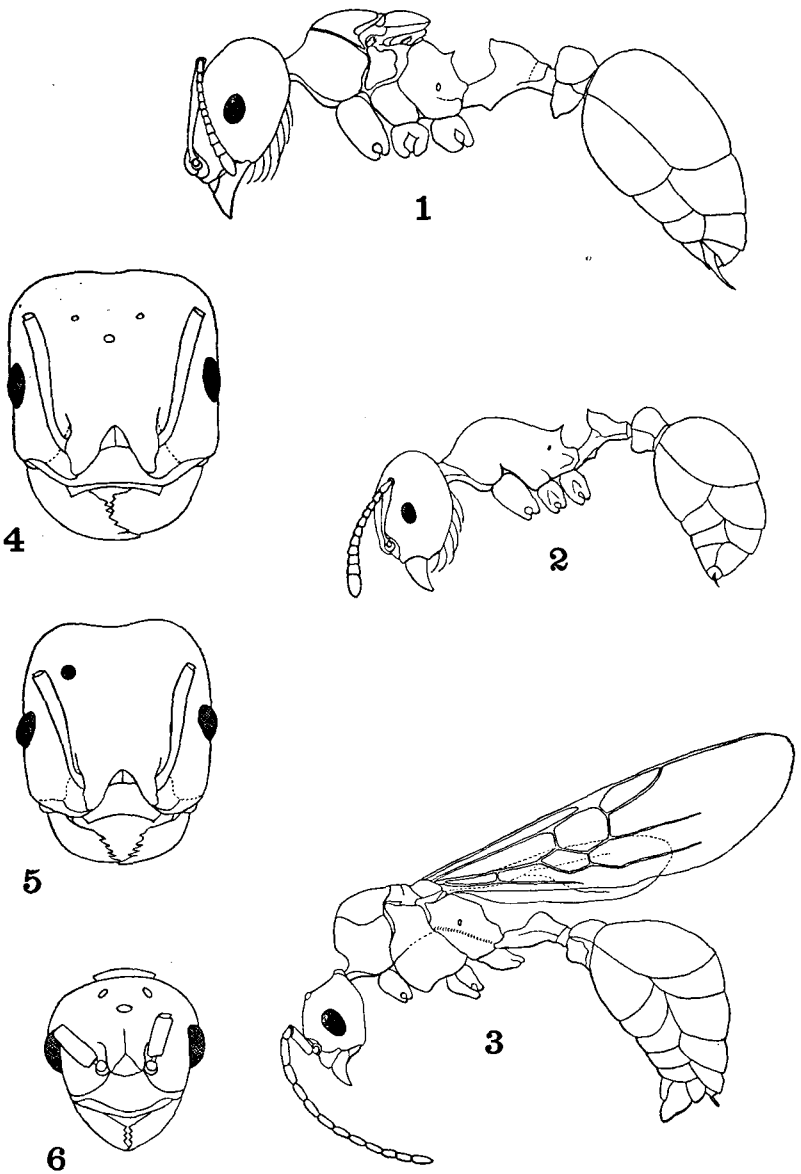
Worker: Length: head (exclusive of the mandibles) 2.25 mm.; thorax 2.75 mm., overall length 5-5.5 mm.

The entire upper surface of the head covered with wavy longitudinal rugae, those at the middle of the head diverging toward the occipital corners. Over most of the upper surface of the head the rugae rarely form reticulations but on the genae and the posterior quarter of the head they are

EXPLANATION TO PLATE 8

Pogonomyrmex huachucanus Wheeler. Fig 1. Female. Fig. 2. Worker. Fig. 3. Male. Fig. 4 Head of female. Fig. 5. Head of worker. Fig. 6. Head of male.

Figs. 1-3 are drawn to the same scale; figs. 4-6 are drawn to the same scale.



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distinctly reticulate. The surface between the rugae is densely and minutely granulose with the granules appearing in certain lights as tiny, crater-like rings. The upper surface of the head is dull or very feebly shining except for the anterior ends of the frontal lobes which are rather strongly shining. Mandibles with coarse longitudinal rugae, the surface between the rugae not sculptured, the entire mandible rather strongly shining. Antennal scapes moderately shining with prominent longitudinal rugules.

Thoracic rugae notably reticulate and not parallel on the pronotum. Those on the mesonotum and the mesopleurae also reticulate but with more of a tendency to form roughly parallel, longitudinal ridges. These reticulate rugae turn upward and become transverse on the basal face of the epinotum. The granulate interrugal sculpture of the thorax is more feeble than that of the head and this makes the thorax somewhat more shining than the head. Posterior face of the node of the petiole reticulo-rugose. The interrugal areas, the front of the node and the entire postpetiole densely and finely granulose, dull or at most very feebly shining. Peduncle of the petiole and the coxae with fine punctures which are more widely spaced and do not dull the shining surface. Gaster very strongly shining with minute, widely scattered piligerous punctures. Femora strongly shining with extremely delicate reticulate sculpture. Tibiae more coarsely sculptered and not so strongly shining.

Erect hairs on the upper surface of the head stout, tapered and rather variable in length. Those on the front of the clypeus long and stout, their length equal to that of the longer hairs in the gular ammochaetae. The hairs in the latter structures rather sparse, less than a dozen present at each side of the head. Hairs of the mandibular ammochaetae much shorter and finer than those of the gula. Erect hairs of the thorax very irregular in length, abundant on the promesonotum but sparser on the epinotum, where they are largely confined to an area just behind the mesoepinotal suture. Erect hairs on the petiole and post-petiole very similar to those of the thorax. Erect gastric hairs more uniform in length than those of the thorax, their length increasing gradually from the base of the gaster to

its tip. Antennal scapes, coxae, femora, tibiae and tarsi with numerous, somewhat finer, erect hairs. Erect hairs on the antennal funiculi numerous and fine and grading to pubescence on the terminal segments.

Color: deep ferrugineous red to orange red, the mandibular borders piceous brown. Edge of the first gastric segment often marked with brown.

Female: Length: head (mandibles excluded) 1.75 mm.; thorax 2.25 mm.; overall length 7-7.5 mm.

Cephalic sculpture very similar to that of the worker but with the longitudinal rugae at the center of the head finer and more regular. The interrugal sculpture is less pronounced than in the worker so that the entire head, especially the middle third, is more shining than that of the worker. Mandibles and antennal scapes as in the worker.

Thoracic rugae everywhere coarse and prominent except on the neck of the pronotum and the declivious face of the epinotum. The neck of the pronotum is transversely rugulose at its anterior edge. Behind this rugulose area is a band of dense, though shallow, punctures interspersed with extremely delicate rugules which extends back to the coarse, reticulate rugae on the humeral angles. Rugae of the scutum highly variable. In some specimens transverse, in others longitudinal. Rugae of the scutellum usually longitudinal. Mesothoracic sternite and episternite longitudinally rugose, the rugae turning upward on the sides of the epinotum and becoming transverse on the basal face of the epinotum. Declivious face of the epinotum with two or three feeble, widely spaced rugae. Interrugal sculpture of the thorax like that of the worker but a little more feeble so that the thorax is slightly more shining than that of the worker. Sculpture of the petiolar nodes, gaster and legs like that of the worker.

Erect hairs on the upper surface of the head, thorax, petiolar nodes and gaster slightly more numerous than those of the worker. Erect hairs elsewhere very similar to those of the worker.

Color ferrugineous red, the masticatory margin of the mandibles and the lateral edges of the dorsum of the first gastric segment banded with piceous brown.

Male: Length: head (mandibles excluded) 1.25 mm.; thorax 2 mm.; overall length 6.5-7 mm.

Upper surface of the head with fine, wavy, longitudinal rugae over most of its middle third. These rugae form few reticulations. The rugae of the lateral portions of the head, the occipital angles, the entire occipital border and the gula, notably reticulate. The surface between the rugae dull and densely punctured, the punctures appearing as tiny craters under high magnification. Frontal groove, frontal area and the clypeus slightly shining. Mandibles longitudinally striate and a little more shining than the clypeus.

Entire thorax feebly shining to dull with punctato-rugose sculpture, the punctures very dense. Rugae on the pronotum, mesothoracic sternite and episternite feeble, often replaced by punctures on the front part of the segments. Scutum, paraptera and scutellum with moderately developed, longitudinal, reticulate rugae in addition to the dense punctures. Metathoracic sternite with coarse longitudinal rugae which turn upward on the sides of the epinotum. Basal face of the epinotum with coarse, reticulate rugae. Rugae on the declivious face of the epinotum transverse. Anterior peduncle of the petiole finely punctate and more shining than the remainder of the petiole. The anterior face of the node of the petiole densely and more coarsely punctate. Crest and rear face of the node and the posterior peduncle with reticulate rugae in addition to the punctures. Postpetiole densely punctate but not rugose. Abdomen smooth and shining with extremely fine, scattered, piligerous punctures. Coxal joints, antennal scapes, fore femora and tarsi delicately reticulo-punctate. Middle and hind femora with similar but feebler sculpture.

Erect hairs of moderate length, yellow-brown, evenly curved, tapered and well-separated. Abundant on the dorsum of the thorax, except on the basal face of the epinotum, where they are restricted to the angle between the basal and the declivious faces. Erect hairs on the head about equally numerous on the upper and lower surfaces. Erect hairs on the petiolar nodes notably sparser than those of the thorax. Erect hairs on the gaster very fine, much shorter than those of the thorax and largely limited to the rear edge of each segment. The remaining gastric hairs very

short and usually fully appressed, rarely a few of them suberect. Antennal scapes and funiculi with dense, short, pubescence.

Color: head, thorax, petiolar nodes and femora piceous black. Antennae, toothed border of the mandibles, tibiae and tarsi blackish brown. Gaster clear, golden yellow.

Wings hyaline, iridescent, the veins and stigma brown in some specimens and white in others. The wings evenly covered with small scattered hairs.

The sexual forms were described from nineteen deälated females and forty-nine males taken by the writer at Springerville, Arizona, July 30, 1950.

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